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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the information record playback approach and information record regenerative apparatus for the information record medium equipped with the drive information field for recording drive information including two or more record playback conditions, and its information record medium.
[0002]
[Description of the Prior Art] The optical disk is known as an information record medium which has a sector structure. In recent years, the densification of an optical disk and large capacity-ization are progressing and it is important to secure the dependability of an optical disk. In order to secure this dependability, the optical disk unit is performing study processing which searches for record playback conditions.
[0003]
[Problem(s) to be Solved by the Invention] It depends for record playback conditions on the property of an optical disk, and the property of an optical disk unit greatly. For this reason, study processing which searches for record playback conditions needs to be repeatedly performed, after equipping an optical disk unit with an optical disk whenever it starts an optical disk unit, or whenever the property of an optical disk or the property of an optical disk unit changes with factors, such as a temperature change.
[0004] Recently, the further densification of an optical disk and large capacity-ization progress and the need of searching for more precise record playback conditions has arisen. However, in order to search for more precise record playback conditions, study processing takes long time amount. Consequently, there was a trouble that the standby time of an optical disk unit became long.
[0005] This invention is made in view of the above-mentioned trouble, and aims at offering the information record medium which can shorten the time amount which the study processing which searches for record playback conditions takes, the information record playback approach, and an information record regenerative apparatus.
[0006]
[Means for Solving the Problem] A data storage area for the information record medium of this invention to record data, It is the information record medium equipped with the 1st drive information field for recording the 1st drive information, and the 2nd drive information field for recording the 2nd drive information. Including two or more record playback conditions, it is arranged in order of the time of day when said two or more record playback conditions were recorded on said information record medium, and, thereby, as for each of said 1st drive information and said 2nd drive information, the above-mentioned object is attained.
[0007] Each of two or more of said record playback conditions may specify the operating condition of said information record regenerative apparatus at the time of the information record regenerative apparatus which can equip with said information record medium carrying out record playback of said data.

[0008] It may be updated so that it may have a content with said same 1st drive information and said 2nd drive information.

[0009] Each of said 1st drive information field and said 2nd drive information field consists of ECC blocks of N individual for calculating an error correcting code, each of two or more of said record playback conditions is recorded in one sector which corresponds among said two or more sectors including the sector of plurality [each / of an ECC block of said N individual], and N may be one or more integers.

[0010] Each of said 1st drive information field and said 2nd drive information field consists of single ECC blocks, and said single ECC block may be recorded including 16 sectors in one sector to which each of 16 record playback conditions corresponds among said 16 sectors.

[0011] A data storage area for the information record playback approach of this invention to record data, It is the information record playback approach for the information record medium equipped with the 1st drive information field for recording the 1st drive information, and the 2nd drive information field for recording the 2nd drive information. Each of said 1st drive information and said 2nd drive information Two or more record playback conditions are included. Said information record playback approach (a) The step which judges whether it is possible to read said 1st drive information from said 1st drive information field, (b) The step which judges whether there are any record playback conditions with the available information record regenerative apparatus which equipped with said information record medium into two or more record playback conditions included in said 1st drive information, (c) when it can be possible to read said 1st drive information and said available record playback conditions cannot be found into said 1st drive information Learn new record playback conditions with said available information record regenerative apparatus equipped with said information record medium, and said new record playback conditions and said 1st drive information are used. The step which updates said 1st drive information and said 2nd drive information is included, and, thereby, the above-mentioned object is attained.

[0012] Each of two or more of said record playback conditions may specify the operating condition of said information record regenerative apparatus at the time of the information record regenerative apparatus which can equip with said information record medium carrying out record playback of said data.

[0013] Said information record playback approach may include further the step which carries out record playback of said data using said 1st drive information, when it is possible to read said 1st drive information.

[0014] Said step (c) may include the step at which said information record regenerative apparatus equipped with said information record medium records available record playback conditions on said 1st drive information as record playback conditions most recorded on said 1st drive information at the latest time of day.

[0015] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said step (c) The step which writes the content of the record playback conditions currently written in the field to which the number 0 of said 1st drive information field - the number 14 were assigned in the field to which it was assigned to each number 1 of said 1st drive information field and said 2nd drive information field - a number 15, (c-1) (c-2) The step which writes the content of said new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field may be included.

[0016] Said information record playback approach can read the 1st drive information of (d) above, and when said available record playback conditions are in said 1st drive information, it may include further the step which updates said 1st drive information and said 2nd drive information using said available record playback conditions and said 1st drive information.

[0017] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said available record playback conditions are written in the field to which the number m of said 1st drive information field was assigned. Said step (d) The step which reads said available record playback conditions from the field where the number m of said 1st drive information field was assigned, (d-1) The step which writes the content of the record playback conditions currently written in the field to which the number 0 of said 1st drive information field - the number (m-1) were assigned in the field to which it was assigned to each number 1 - number m of said 1st drive information field and said 2nd drive information field, (d-2) (d-3) The step which writes the content of said available record playback conditions by which reading appearance was carried out in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field may be included.

[0018] Said 1st drive information field consists of ECC blocks of N individual for calculating an error correcting code, each of two or more of said record playback conditions that each of an ECC block of said N individual is contained in said 1st drive information including two or more sectors is recorded in one sector which corresponds among said two or more sectors, and N may be one or more integers.

[0019] The judgment with possible reading said 1st drive information may be performed based on whether all playbacks of an ECC block of said N individual contained to said 1st drive information field are successful.

[0020] The step which judges that said information record playback approach can read said 2nd drive information from the 2nd drive information field of (e) above, (f) The step which judges whether there are any record playback conditions with the available information record regenerative apparatus which equipped with said information record medium into two or more record playback conditions included in said 2nd drive information, It is impossible to read said 1st drive information. (g) -- When it can be possible to read said 2nd drive information and said available record playback conditions cannot be found into said 2nd drive information Said information record regenerative apparatus equipped with said information record medium may learn available new record playback conditions, and may include further the step which updates said 1st drive information and said 2nd drive information using said new record playback conditions and said 2nd drive information.

[0021] Said information record playback approach may include further the step which carries out record playback of said data using said 2nd drive information, when it is possible to read said 2nd drive information.

[0022] Said step (g) may include the step at which said information record regenerative apparatus equipped with said information record medium records available record playback conditions on said 2nd drive information as record playback conditions most recorded on said 2nd drive information at the latest time of day.

[0023] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said step (g) The step which writes the content of the record playback conditions currently written in the field to which the number 0 of said 2nd drive information field - the number 14 were assigned in the field to which it was assigned to each number 1 of said 1st drive information field and said 2nd drive information field - a number 15, (g-1) (g-2) The step which writes the content of said new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field may be

included.
[0024] Said information record playback approach cannot read the 1st drive information of (h) above. and when it is possible to read said 2nd drive information and said available record playback conditions are in said 2nd drive information The step which updates said 1st drive information and said 2nd drive information may be further included using said available record playback conditions and said 2nd drive information.
[0025] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said available record playback conditions are written in the field to which the number m of said 2nd drive information field was assigned. Said step (h) The step which reads said available record playback conditions from the field where the number m of said 2nd drive information field was assigned, (h-1) The step which writes the content of the record playback conditions currently written in the field to which the number 0 of said 2nd drive information field - the number (m-1) were assigned in the field to which it was assigned to each number 1 - number m of said 1st drive information field and said 2nd drive information field, (h-2) (h-3) The step which writes the content of said available record playback conditions by which reading appearance was carried out in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field may be included.
[0026] Said 2nd drive information field consists of ECC blocks of N individual for calculating an error correcting code, each of two or more of said record playback conditions that each of an ECC block of said N individual is contained in said 2nd drive information including two or more sectors is recorded in one sector which corresponds among said two or more sectors, and N may be one or more integers.
[0027] The judgment with possible reading said 2nd drive information may be performed based on whether all playbacks of an ECC block of said N individual contained to said 2nd drive information field are successful.
[0028] When said information record playback approach cannot read the 1st drive information of (i) above and it is impossible to read said 2nd drive information Said information record regenerative apparatus equipped with said information record medium may learn available new record playback conditions, and may include further the step which updates said 1st drive information and said 2nd drive information using said new record playback conditions.
[0029] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. The step at which said step (i) writes the content of said (i-1) new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field, (i-2) The step which buries the content of the record playback conditions currently written in the field to which each number 1 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned by "00" h may be included.
[0030] A data storage area for the information record regenerative apparatus of this invention to record data, It is an information record regenerative apparatus for the information record medium equipped with the 1st drive information field for recording the 1st drive information, and the 2nd drive information field for recording the 2nd drive information. Each of said 1st drive information and said 2nd drive information Two or more record playback conditions are included. Said information record regenerative apparatus It has the drive information read-out section, the study processing section, and the renewal section of drive information. Said drive information read-out section It judges whether it is

possible to read said 1st drive information from said 1st drive information field. Said study processing section It judges whether record playback conditions with said available information record regenerative apparatus are in two or more record playback conditions included in said 1st drive information. When it can be possible to read said 1st drive information and said available record playback conditions cannot be found into said 1st drive information Said study processing section learns new record playback conditions with said available information record regenerative apparatus. Said renewal section of drive information Using said new record playback conditions and said 1st drive information, said 1st drive information and said 2nd drive information are updated, and, thereby, the above-mentioned object is attained.

[0031] Each of two or more of said record playback conditions may specify the operating condition of said information record regenerative apparatus at the time of the information record regenerative apparatus which can equip with said information record medium carrying out record playback of said data.

[0032] Said information record regenerative apparatus may be further equipped with the control section which carries out record playback of said data using said 1st drive information, when it is possible to read said 1st drive information.

[0033] Said information record regenerative apparatus may record said renewal section of drive information on said 1st drive information as record playback conditions most recorded on said 1st drive information at the latest time of day in available record playback conditions.

[0034] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said renewal section of drive information is written in the field to which the content of the record playback conditions currently written in the field to which the number 0 of said 1st drive information field - the number 14 were assigned was assigned to each number 1 of said 1st drive information field and said 2nd drive information field - a number 15. You may also write the content of said new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.

[0035] Said renewal section of drive information can read said 1st drive information, and when said available record playback conditions are in said 1st drive information, it may update said 1st drive information and said 2nd drive information using said available record playback conditions and said 1st drive information.

[0036] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said available record playback conditions are written in the field to which the number m of said 1st drive information field was assigned. Said renewal section of drive information Said available record playback conditions are read from the field where the number m of said 1st drive information field was assigned. The content of the record playback conditions currently written in the field to which the number 0 of said 1st drive information field - the number (m-1) were assigned is written in the field to which it was assigned to each number 1 - number m of said 1st drive information field and said 2nd drive information field. You may also write the content of said available record playback conditions by which reading appearance was carried out in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.

[0037] Said 1st drive information field consists of ECC blocks of N individual for calculating an error correcting code, each of two or more of said record playback conditions that each of an ECC block of said N individual is contained in said 1st drive information including two or more sectors is recorded in

one sector which corresponds among said two or more sectors, and N may be one or more integers.
[0038] The judgment with possible reading said 1st drive information may be performed based on whether all playbacks of an ECC block of said N individual contained to said 1st drive information field are successful.
[0039] It judges that said drive information read-out section can read said 2nd drive information from said 2nd drive information field. Said study processing section It judges whether record playback conditions with said available information record regenerative apparatus are in two or more record playback conditions included in said 2nd drive information. It is impossible to read said 1st drive information, and it is possible to read said 2nd drive information. and when said available record playback conditions cannot be found into said 2nd drive information Said study processing section may learn new record playback conditions with said available information record regenerative apparatus, and said renewal section of drive information may update said 1st drive information and said 2nd drive information using said new record playback conditions and said 2nd drive information.
[0040] Said information record regenerative apparatus may be further equipped with the control section which carries out record playback of said data using said 2nd drive information, when it is possible to read said 2nd drive information.
[0041] Said information record regenerative apparatus may record said renewal section of drive information on said 2nd drive information as record playback conditions most recorded on said 2nd drive information at the latest time of day in available record playback conditions.
[0042] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said renewal section of drive information is written in the field to which the content of the record playback conditions currently written in the field to which the number 0 of said 2nd drive information field - the number 14 were assigned was assigned to each number 1 of said 1st drive information field and said 2nd drive information field - a number 15. You may also write the content of said new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.
[0043] Said renewal section of drive information cannot read said 1st drive information, and can read said 2nd drive information, and when said available record playback conditions are in said 2nd drive information, it may update said 1st drive information and said 2nd drive information using said available record playback conditions and said 2nd drive information.
[0044] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said available record playback conditions are written in the field to which the number m of said 2nd drive information field was assigned. Said renewal section of drive information Said available record playback conditions are read from the field where the number m of said 2nd drive information field was assigned. The content of the record playback conditions currently written in the field to which the number 0 of said 2nd drive information field - the number (m-1) were assigned is written in the field to which it was assigned to each number 1 - number m of said 1st drive information field and said 2nd drive information field. You may also write the content of said available record playback conditions by which reading appearance was carried out in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.
[0045] Said 2nd drive information field consists of ECC blocks of N individual for calculating an error correcting code, each of two or more of said record playback conditions that each of an ECC block of said N individual is contained in said 2nd drive information including two or more sectors is recorded in

one sector which corresponds among said two or more sectors, and N may be one or more integers.
[0046] The judgment with possible reading said 2nd drive information may be performed based on whether all playbacks of an ECC block of said N individual contained to said 2nd drive information field are successful.
[0047] When it is impossible to read said 1st drive information and it is impossible to read said 2nd drive information, said study processing section may learn new record playback conditions with said available information record regenerative apparatus, and said renewal section of drive information may update said 1st drive information and said 2nd drive information using said new record playback conditions.
[0048] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said renewal section of drive information is written in the field to which the content of said new record playback conditions was assigned to each number 0 of said 1st drive information field and the 2nd drive information field. The content of the record playback conditions currently written in the field to which each number 1 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned may be fill uped with "00" h.
[0049]
[Embodiment of the Invention] The information record medium of this invention has the drive information field for recording record playback conditions. By performing study processing, an information record regenerative apparatus searches for record playback conditions, and records the record playback condition on the drive information field of an information record medium. The record playback conditions recorded on the drive information field of an information record medium are used in order to carry out reading appearance and to search for new record playback conditions, in case next study processing is performed.
[0050] Here, record playback conditions mean the operating condition of the optical disk unit at the time of reproducing the information which the optical disk unit recorded information on the optical disk, or was recorded on the optical disk.
[0051] Record playback conditions contain at least one of the pulse conditions about the laser pulse irradiated by the optical disk, the servo conditions which opt for actuation of the various servoes at the time of record playback, and the regenerative-signal processing conditions for processing a regenerative signal.
[0052] Pulse conditions include the power value of the laser pulse irradiated by the optical disk for example, at the time of record. Or pulse conditions may include the conditions of the laser pulse for forming a mark (informational smallest unit) on an optical disk. In case a mark is formed on an optical disk, in applying to the back end from the front end of a mark and irradiating two or more pulses at an optical disk The generating timing of the 1st pulse corresponding to the front end of the mark in pulse conditions, The die length and the laser luminous intensity of the 1st pulse of the 1st pulse, and the generating timing of the last pulse corresponding to the back end of the mark, It is set according to the die length of the last pulse, and the die length of the tooth space arranged before and after the die length and the mark of a mark including at least one of the laser luminous intensities of the last pulse.
[0053] Or record playback conditions may be code information which shows the set point of the various circuits included in an information record regenerative apparatus, or its set point.
[0054] Thus, it becomes possible to simplify study processing by reusing the record playback conditions recorded on the drive information field of an information record medium. Consequently, it becomes possible to shorten the time amount which study processing takes, and it becomes possible to shorten the standby time of an information record regenerative apparatus.
[0055] Hereafter, the gestalt of operation of this invention is explained, referring to a drawing.
[0056] (Gestalt 1 of operation) Drawing 1 shows the structure of the information record medium 101 of

the gestalt 1 of operation of this invention. The information record medium 101 may be the optical disk of arbitration, such as DVD-RAM.

[0057] Two or more trucks 102 are formed in the optical disk 101 concentric circular. Or the single truck 102 may be formed in the optical disk 101 in the shape of a spiral, and two or more trucks 102 may be formed in it in the shape of a spiral. The truck 102 is divided into two or more sectors 103.

[0058] The field of an optical disk 101 includes one or more disk information fields 104 and a data storage area 105.

[0059] Various kinds of parameters needed in order to access an optical disk 101 are stored in the disk information field 104. The disk information field 104 is arranged at the most inner circumference and the outermost periphery of an optical disk 101. The disk information field 104 arranged at the most inner circumference of an optical disk 101 is also called a lead-in groove field (Lead-inArea). The disk information field 104 arranged at the outermost periphery of an optical disk 101 is also called a lead-out field (Lead-out Area).

[0060] Record playback of data is performed to a data storage area 105. The absolute address called physical sector number (it abbreviates to PSN below Physical Sector Number;) is assigned to all the sectors 103 prepared in the data storage area 105.

[0061] Drawing 2 shows the structure of the disk information field 104 (namely, lead-in groove field 201) arranged at the most inner circumference of the optical disk 101 shown in drawing 1 . In addition, it may have the same structure as the structure by which the disk information field 104 arranged at the outermost periphery of the optical disk 101 shown in drawing 1 is also shown in drawing 2 .

[0062] The lead-in groove field 201 includes the mirror field 203 prepared between the embossing field 202 which recorded information, such as identification information of an optical disk 101, by the embossing pit, the data storage area 204 which records data, and the embossing field 202 and a data storage area 204.

[0063] A data storage area 204 includes the guard field 205 which does not contain data, the disk test field 206 which are used in an optical disk 101 in order to inspect the quality of an optical disk 101 in a production process, the drive test field 207 which are used in order that an optical disk unit may verify the condition of the optical disk 101 with which the optical disk unit was equipped, the disk discernment field 208 which are used since information, such as various properties of an optical disk 101, is stored, and the defective management domain 209 which store defective management information.

[0064] The disk discernment field 208 includes four disk identification information fields 210, one drive information field 211, and three reservation fields 212. Each of four disk identification information fields 210 consists of one ECC block. The drive information field 211 consists of one ECC block. Each of three reservation fields 212 consists of one ECC block. An ECC block is used in order to calculate an error correcting code. An error correcting code is calculated per ECC block.

[0065] Drawing 3 shows the relation between the structure of an ECC block, and the structure of a sector 103 prepared in the optical disk 101. When an optical disk 101 is a mass optical disk (for example, DVD), in order to reconcile high error correction capacity and low redundancy, one ECC block consists of 16 sectors. However, in the example shown in drawing 3 , since it is easy, it is assumed that one ECC block consists of four sectors.

[0066] As shown in drawing 3 , an ECC block contains the outside sign parity PO obtained by calculating an error correcting code for every train of the Maine data arranged at 172 byte x48 line, and the inner sign parity PI obtained by calculating an error correcting code for every line (in longitudinal direction) and the Maine data of the Maine data (to lengthwise direction).

[0067] Generally the sign containing inner sign parity and outside sign parity is called a product code. A product code is error correcting system strong against both a random error and a burst error (error concentrated locally). For example, in addition to a random error, the case where the burst error for two lines occurs in a scratch is considered. Since most will be a 2-byte error if it sees from an outside sign, a burst error can be corrected. Although an error remains without the ability correcting the train in which many random errors existed with an outside sign, this error that remained can be corrected with an inner sign, when the most. If it corrects with an outside sign again even if an error remains also with an inner

sign, an error can be reduced further. Sufficient correction capacity is realized in DVD, stopping the redundancy of parity by having adopted such a product code. In other words, the capacity of the part which stopped the redundancy of parity, and user data can be raised.
[0068] As shown in drawing 3 , sign parity is uniformly distributed to each sector for every line outside the ECC block. Consequently, one sector consists of data of 182 byte x13 line.
[0069] If an optical disk unit is ordered to perform record or playback per sector to the optical disk 101 with which the optical disk unit was equipped, after it will reproduce the ECC block containing the specified sector from an optical disk 101 and will perform an error correction, it records only a part for the data division equivalent to the specified sector on an optical disk 101. If it is ordered for an optical disk unit to record per sector to the optical disk 101 with which the optical disk unit was equipped The ECC block containing the specified sector is reproduced from an optical disk 101. After performing an error correction, it transposes to the data which should record a part for the data division equivalent to the specified sector, and reattaches to the data which should re-calculate and record an error correcting code, and the ECC block containing the specified sector is recorded on an optical disk 101.
[0070] In the following explanation, a block means the ECC block mentioned above.
[0071] Drawing 4 shows the structure of the drive information 401 recorded on the drive information field 211 shown in drawing 2 . The drive information 401 contains two or more record playback condition 401a. Each of two or more record playback condition 401a specifies the operating condition of the optical disk unit at the time of the optical disk unit which can equip with an optical disk 101 carrying out record playback of the data. One or more record playback condition 401a may be specified to one or more optical disk units among two or more record playback condition 401a.
[0072] The drive information 401 is expressed in the form of the list of two or more record playback condition 401a. Therefore, the drive information 401 is also called a record playback condition list.
[0073] In drawing 4 , in order to show the time series of record playback condition 401a, explanation attaches the value following notation # for convenience, and it is not included in the content of record playback condition 401a. Here, n is zero or more integers. In the example shown in drawing 4 , the drive information 401 contains 16 record playback condition 401a.
[0074] Record playback condition 401a includes the manufacturer identifier 402 for identifying the manufacturer who manufactured the optical disk unit, the drive identifier 403 for identifying the optical disk unit in the manufacturer, the study sequence identifier 404 for identifying the sequence which searched for the record playback condition in the optical disk unit, and the study result storing field 405 that stores the record playback conditions searched for.
[0075] Hereafter, the updating approach of the drive information 401 is explained. An optical disk unit acquires the drive information 401 by reproducing the drive information field 211 established in the optical disk 101 with which the optical disk unit was equipped, before performing study processing which searches for record playback conditions.
[0076] When record playback condition 401a with the available optical disk unit which equipped with the optical disk 101 into 16 record playback condition 401a contained in the drive information 401 exists, an optical disk unit reproduces the data which recorded data on the optical disk 101, or were recorded on the optical disk 101 using the available record playback condition 401a. For example, when the manufacturer identifier and drive identifier which a specific optical disk unit holds are in agreement with the manufacturer identifier 402 and the drive identifier 403 which are contained in record playback condition 401a, the record playback condition 401a is made available to the specific optical disk unit.
[0077] When record playback condition 401a with the available optical disk unit which equipped with the optical disk 101 on the other hand into 16 record playback condition 401a contained in the drive information 401 does not exist, an optical disk unit newly learns record playback conditions with the available optical disk unit by performing study processing. An optical disk unit reproduces the data which recorded data on the optical disk 101, or were recorded on the optical disk 101 using the newly learned record playback conditions.
[0078] An optical disk unit compares the study sequence identifier 404 contained in 16 each of record playback condition 401a which is contained in the drive information 401, and deletes record playback

condition 401a containing the oldest study sequence identifier 404 from the drive information 401. An optical disk unit records the newly learned record playback conditions on the field of the deleted record playback condition.

[0079] Thus, the drive information 401 is updated by permuting the content of record playback condition 401a containing the oldest study sequence identifier 404 by the content of the newly learned record playback conditions. The updated drive information 401 is recorded on the drive information field 211 of an optical disk 101. Thereby, renewal of the drive information 401 is completed.

[0080] However, since it depends for old and new [of record playback condition 401a contained in the drive information 401] on the study sequence identifier 404 according to the updating approach of the drive information 401 mentioned above, a byroad exists. For example, if the largest value 9999 is set as the study sequence identifier 404 when expressing the study sequence identifier 404 with the decimal number of 4 figures, record playback condition 401a containing the study sequence identifier 404 which has a value 9999 will not be forever deleted from the drive information 401. If it sees for the manufacturer who manufactures the optical disk unit, since it is advantageous that record playback conditions available to an optical disk unit are not erased, the low manufacturer of morals does not set an intentionally big value as the study sequence identifier 404, either.

[0081] Thus, if the case where a manufacturer sets an intentionally big value as the study sequence identifier 404 is assumed, guarantee of being updated so that the drive information 401 may contain record playback condition 401a which always shows the newest study result will be lost.

[0082] Moreover, with the gestalt 1 of operation, only 1 block of drive information fields 211 is not formed. For this reason, a blemish is sufficient for the drive information field 211 just, and when dust, a fingerprint, etc. adhere to the drive information field 211, there is also a possibility of saying that playback of the drive information field 211 becomes impossible.

[0083] The structure of the optical disk improved in order to solve such a technical problem, and the updating approach of drive information are explained in the gestalt 2 of operation.

[0084] (Gestalt 2 of operation) With the gestalt 2 of operation, the information record medium which can guarantee that drive information includes the record playback conditions which always show the newest study result, and the information record playback approach are offered.

[0085] The structure of the information record medium of the gestalt 2 of operation of this invention is the same as the structure of the information record medium 101 shown in drawing 1 . The information record medium 101 may be the optical disk of arbitration, such as DVD-RAM.

[0086] Drawing 5 shows the structure of the information recorded on the disk discernment field 208 shown in drawing 2 . The disk discernment field 208 includes the disk identification information field 501, the drive information field 502, and the reservation field 503.

[0087] The drive information field 502 contains 1st drive information field 502a for recording the drive information 521 as the 1st drive information, and 2nd drive information field 502b for recording the drive information 522 as the 2nd drive information.

[0088] Each of 1st drive information field 502a and 2nd drive information field 502b consists of ECC blocks of a single, and the ECC block consists of 16 sectors.

[0089] It is updated so that it may have a content with same drive information 521 and drive information 522.

[0090] Each of the drive information 521 and the drive information 522 contains two or more record playback condition 521a. Each of two or more record playback condition 521a specifies the operating condition of the optical disk unit at the time of the optical disk unit which can equip with an optical disk 101 carrying out record playback of the data. One or more record playback condition 521a may be specified to one or more optical disk units among two or more record playback condition 521a.

[0091] Each of the drive information 521 and the drive information 522 is expressed in the form of the list of two or more record playback condition 521a. Therefore, each of the drive information 521 and the drive information 522 is also called a record playback condition list.

[0092] In drawing 5 , in order to show the time series of record playback condition 521a, explanation attaches the value following notation # for convenience, and it is not included in the content of record playback condition 521a. Here, n is zero or more integers. In the example shown in drawing 5 , each of the drive information 521 and the drive information 522 contains 16 record playback condition 521a. 16 each of record playback condition 521a is recorded in one sector.

[0093] 16 record playback condition 521a is arranged in order of the time of day recorded on the optical disk 101. For example, 16 record playback condition 521a is arranged by the sequence from a thing to the old new thing of the time of day recorded on the optical disk 101. In this case, among 16 record playback condition 521a, record playback condition 521a most recorded on the optical disk 101 recently is arranged at the head of the record playback condition list, and record playback condition 521a recorded in ancient times by the optical disk 101 among 16 record playback condition 521a is arranged at the tail of a record playback condition list.

[0094] Record playback condition 521a includes the manufacturer identifier 531 for identifying the manufacturer who manufactured the optical disk unit, the drive identifier 532 for identifying the optical disk unit in the manufacturer, and the study result storing field 533 that stores the record playback conditions searched for when the optical disk unit performed study processing.

[0095] Thus, by recording the same record playback conditions on the drive information 521 and the drive information 522, a blemish is sufficient for the drive information field 502 just, and that dust, a fingerprint, etc. adhere to the drive information field 502 makes small possibility that acquisition of the list of record playback condition 521a will go wrong, owing to.

[0096] Moreover, record playback condition 521a called for by new study processing is always recorded on the location of the head of the drive information 521 and the drive information 522. It is guaranteed that the drive information 521 and the drive information 522 include by this 16 record playback conditions which always show the newest study result.

[0097] In addition, although [the gestalt 2 of operation] the drive information field 502 contains 1st drive information field 502a and 2nd drive information field 502b, the number of the drive information fields included to the drive information field 502 is not necessarily limited to 2. The drive information field 502 may include the drive information field of the number of two or more arbitration.

[0098] Moreover, each of 1st drive information field 502a and 2nd drive information field 502b may consist of ECC blocks of N individual. Each of an ECC block of N individual contains two or more sectors. Each of two or more record playback condition 521a contained in the drive information 521 is recorded in one sector which corresponds among two or more of the sectors. Each of two or more record playback condition 521a contained in the drive information 522 is recorded in one sector which corresponds among two or more of the sectors. Here, N is the integer of one or more arbitration.

[0099] Hereafter, the updating approach of the drive information 521 is explained with reference to drawing 6 and drawing 7 . The drive information 522 is updated so that it may have the same content as the drive information 521. Therefore, since the updating approach of the drive information 522 is the same as that of the drive information 521, the explanation is omitted here.

[0100] Drawing 6 shows by comparison the structure of the drive information 521 before updating at the time of not existing record playback condition 521a with the available optical disk unit which equipped with the optical disk 101 into 16 record playback condition 521a contained in the drive information 521, and the structure of the drive information 521 after updating. An update process of the drive information 521 is performed when an optical disk unit is equipped with an optical disk 101.

[0101] In drawing 6 , in order to show the time series of record playback condition 521a, explanation attaches the value following notation # for convenience, and it is not included in the content of record playback condition 521a. Here, n is zero or more integers.

[0102] 1st drive information field 502a has the field where the number 0 - the number 15 were assigned. The drive information 521 contains 16 record playback condition 521a. 16 record playback condition 521a is written in the field to which the number 0 of 1st drive information field 502a - the number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on the optical disk 101. Namely, record playback condition 521a most recorded on the optical disk 101 among 16 record playback condition 521a recently It is written in the field to which the number 0 of 1st drive information field 502a was assigned. Record playback condition 521a recorded on the optical disk 101 in ancient times among 16 record playback condition 521a is written in the field to which the number 15 of 1st drive information field 502a was assigned.

[0103] After writing the content of record playback condition 521a currently written in the field to which the number 0 of 1st drive information field 502a - the number 14 were assigned, respectively in the field to which it was assigned to the number 1 of 1st drive information field 502a - the number 15 The drive information 521 is updated by writing the content of the record playback conditions newly learned by the optical disk unit in the field to which it was assigned to the number 0 of 1st drive information field 502a. consequently, the content of record playback condition 521a (namely, record regenerative-apparatus 521a written in the field to which the number 15 of 1st drive information field 502a was assigned) which was alike in ancient times and was recorded on the optical disk 101 is deleted from a record playback condition list.

[0104] Thus, oldest record playback condition 521a will be deleted by updating the drive information 521 among 16 record playback condition 521a contained in the drive information 521. Consequently, it is guaranteed that the drive information 521 always contains the newest 16 record playback condition 521a.

[0105] In addition, although the record playback conditions searched for by study processing from the head of a record playback condition list were assigned with the gestalt 2 of operation, record playback conditions may be assigned from the tail of a record playback condition list.

[0106] Drawing 7 shows by comparison the structure of the drive information 521 before updating in the case of existing record playback condition 521a with the available optical disk unit which equipped with the optical disk 101 into 16 record playback condition 521a contained in the drive information 521, and the structure of the drive information 521 after updating. An update process of the drive information 521 is performed when an optical disk unit is equipped with an optical disk 101.

[0107] In drawing 7 , in order to show the time series of record playback condition 521a, explanation attaches the value following notation # for convenience, and it is not included in the content of record playback condition 521a. Here, n and m are zero or more integers.

[0108] For example, the manufacturer identifier and drive identifier which an optical disk unit holds assume that it was in agreement with the manufacturer identifier 531 and the drive identifier 532 which are contained in record playback condition 521a currently recorded on the field to which the number m of 1st drive information field 502a was assigned. In this case, it is checked whether that record playback condition 521a is actually available to that optical disk unit. After the check, reading appearance of the record playback condition 521a is carried out from the field where the number m of 1st drive information field 502a was assigned. Record playback condition 521a by which reading appearance was carried out is stored in the buffer for evacuation (not shown). Next, the content of the record playback conditions currently written in the field to which the number 0 of 1st drive information field 502a - the number (m-1) were assigned is written in the field to which the number 1 - number m of 1st drive information field 502a were assigned. Next, the content of record playback condition 521a stored in the buffer for the evacuation is written in the field to which the number 0 of 1st drive information field 502a was assigned.

[0109] Thus, record playback condition 521a (namely, record regenerative-apparatus 521a recorded on the field to which the number m of 1st drive information field 502a was assigned) with the available optical disk unit equipped with an optical disk 101 is written in the field to which the number 0 of 1st drive information field 502a was assigned.

[0110] Thus, record playback condition 521a most accessed recently among 16 record playback condition 521a contained in the drive information 521 will be recorded on the field to which the number 0 of the 1st drive information field was always assigned by updating the drive information 521. Consequently, it is guaranteed that the drive information 521 always contains the newest 16 record playback condition 521a.

[0111] In addition, although the record playback condition list was updated with the gestalt 2 of operation by moving the record playback conditions a manufacturer identifier and whose drive identifiers corresponded to the head of a record playback condition list It moves one sector of low-

ranking record playback conditions at a time to a high order from the record playback conditions a manufacturer identifier and whose drive identifiers corresponded, and you may make it move the record playback conditions a manufacturer identifier and whose drive identifiers corresponded to the tail of a record playback condition list.
[0112] (Gestalt 3 of operation) The configuration of the information record regenerative apparatus (optical disk unit) 800 which records information on the information record medium explained with the gestalt 2 of operation hereafter, or reproduces the information recorded on the information record medium is explained.
[0113] Drawing 8 shows the configuration of the optical disk unit 800 of the gestalt 3 of operation of this invention.
[0114] The optical disk unit 800 is connected to the high order control device (not shown) through I/O bus 870. Typically, a high order control unit is a host computer.
[0115] The instruction-processing section 810 in which an optical disk unit 800 processes the instruction from a high order control unit, The record control section 820 which performs control at the time of record on a rewriting mold disk, and the playback control section 830 which performs control at the time of the playback from a rewriting mold disk, It has functionally the drive information storing buffer 840 which stores the reproduced drive information 521, the data buffer 850 which stores record and playback data temporarily, and the learning-information processing section 860 which controls study processing.
[0116] The drive information read-out section 861 which the learning-information processing section 860 reads the drive information 521 from 1st drive information field 502a, and reads the drive information 522 from 2nd drive information field 502b, The study processing section 862 which controls study processing of record playback conditions, and the drive information 521 and the drive information 522 are updated. The renewal section 863 of drive information which records the updated drive information 521 on 1st drive information field 502a, and records the updated drive information 522 on 2nd drive information field 502b is included.
[0117] Drawing 9 shows the procedure of drive information read-out processing. This processing is performed by the drive information read-out section 861 of the optical disk unit 800 shown in drawing 8 . In addition, in the example shown in drawing 9 , it is assumed that each of 1st drive information field 502a and 2nd drive information field 502b consists of single ECC blocks.
[0118] It judges that the drive information read-out section 861 can read the drive information 521 from 1st drive information field 502a prepared in the optical disk 101 using the playback control section 830 (step 901). This judgment is performed based on whether playback of an ECC block of 1st drive information field 502a was successful. When it is judged with it being possible to read the drive information 521 from 1st drive information field 502a when playback of an ECC block of 1st drive information field 502a is successful and playback of an ECC block of 1st drive information field 502a goes wrong, it is judged with it not being possible to read the drive information 521 from 1st drive information field 502a.
[0119] If judged with it being possible to read the drive information 521 from 1st drive information field 502a (it sets to the judgment of step 901 and is "Yes"), the drive information read-out section 861 will store in the drive information storing buffer 840 the drive information 521 by which reading appearance was carried out, and will use the drive information 521 (step 903). For example, the drive information 521 may be used in study processing of record playback conditions. Or you may make it reproduce the data which recorded data on the optical disk 101, or were recorded on the optical disk 101 using the drive information 521.
[0120] If judged with it not being possible to read the drive information 521 from 1st drive information field 502a (it sets to the judgment of step 901 and is "No"), it will judge that the drive information read-out section 861 can read the drive information 522 from 2nd drive information field 502b prepared in the optical disk 101 using the playback control section 830 (step 902). This judgment is performed based on whether playback of an ECC block of 2nd drive information field 502b was successful. When it is judged with it being possible to read the drive information 522 from 2nd drive information field 502b when playback of an ECC block of 2nd drive information field 502b is successful and playback of an

ECC block of 2nd drive information field 502b goes wrong, it is judged with it not being possible to read the drive information 522 from 2nd drive information field 502b.
[0121] If judged with it being possible to read the drive information 522 from 2nd drive information field 502b (it sets to the judgment of step 902 and is "Yes"), the drive information read-out section 861 will store in the drive information storing buffer 840 the drive information 522 by which reading appearance was carried out, and will use the drive information 522 (step 904). For example, the drive information 522 may be used in study processing of record playback conditions. Or you may make it reproduce the data which recorded data on the optical disk 101, or were recorded on the optical disk 101 using the drive information 522.
[0122] If judged with it not being possible to read the drive information 522 from 2nd drive information field 502b (it sets to the judgment of step 902 and is "No"), the drive information read-out section 861 will generate the drive information fill uped with NULL value "00" h, will store the drive information in the drive information storing buffer 840, and will use the drive information (step 905). For example, the drive information fill uped with NULL value"00h" may be used in study processing of record playback conditions. Or you may make it reproduce the data which recorded data on the optical disk 101, or were recorded on the optical disk 101 using the drive information fill uped with NULL value"00h."
[0123] Thus, the drive information read-out section 861 uses the drive information 521 currently recorded on 1st drive information field 502a, when it succeeds in playback of an ECC block of the 1st block of the drive information field 502. Moreover, although the drive information read-out section 861 failed in playback of an ECC block of the 1st block of the drive information field 502, when it succeeds in playback of an ECC block of the 2nd block of the drive information field 502, it uses the drive information 522 stored in 2nd drive information field 502b. Furthermore, when playback of an ECC block of the 1st block of the drive information field 502 goes wrong and playback of an ECC block of the 2nd block of the drive information field 502 goes wrong, the drive information read-out section 861 generates the drive information which NULL-buried and was carried out, and uses the drive information.

[0124] In addition, when 1st drive information field 502a consists of ECC blocks of N individual, the judgment of step 901 is performed based on whether all playbacks of an ECC block of N individual contained in 1st drive information field 502a were successful. Here, N is the integer of one or more arbitration. When it is judged with it being possible to read the drive information 521 from 1st drive information field 502a when all playbacks of an ECC block of N individual are successful and at least one playback of an ECC block of N individual goes wrong, it is judged with it not being possible to read the drive information 521 from 1st drive information field 502a.
[0125] Similarly, when 2nd drive information field 502b consists of ECC blocks of N individual, the judgment of step 902 is performed based on whether all playbacks of an ECC block of N individual contained in 2nd drive information field 502b were successful. Here, N is the integer of one or more arbitration. When it is judged with it being possible to read the drive information 522 from 2nd drive information field 502b when all playbacks of an ECC block of N individual are successful and at least one playback of an ECC block of N individual goes wrong, it is judged with it not being possible to read the drive information 522 from 2nd drive information field 502b.
[0126] In addition, in the case of N= 1, the example of the drive information read-out processing shown in drawing 9 corresponds.
[0127] Drawing 10 shows the procedure of study processing, and the procedure of an update process of drive information. Study processing is performed by the study processing section 862. An update process of drive information is performed by the renewal section 863 of drive information.
[0128] The study processing section 862 reads the drive information stored in the drive information storing buffer 840, and judges whether record playback conditions with an available optical disk unit 800 exist in two or more record playback conditions included in the drive information (step 1001). This judgment is made by comparing the manufacturer identifier and drive identifier which are contained in record playback conditions with the manufacturer identifier and drive identifier which an optical disk unit 800 holds. When there are record playback conditions that a manufacturer identifier and a drive

identifier are in agreement, the study processing section 862 reproduces the information which recorded information on the optical disk 101, or was recorded on the optical disk 101 using the record control section 820 and the playback control section 830 according to the record playback condition.
[0129] It judges whether the record playback condition is suitable for the study processing section 862 by performing trial record (step 1002). When judged with the record playback condition being suitable, processing is completed without performing renewal of study processing and drive information.
[0130] When there are no record playback conditions that a manufacturer identifier and a drive identifier are in agreement at step 1001, on the other hand, and when it is not judged with the record playback conditions that a manufacturer identifier and a drive identifier are in agreement at step 1002 being suitable, the study processing section 862 performs study processing, and stores the newly learned record playback conditions in a data buffer 850 (step 1003). The study processing section 862 reproduces the information which recorded information on the optical disk 101 through the record control section 820 and the playback control section 830, or was recorded on the optical disk 101 according to the record playback conditions stored in the data buffer 850.
[0131] It judges whether the record playback condition is suitable for the study processing section 862 by performing trial record (step 1004). When judged with the record playback condition not being suitable, the study processing section 862 returns processing to step 1003, performs study processing again, and searches for the newly learned record playback conditions.
[0132] On the other hand, in step 1004, when judged with the record playback condition being suitable, the renewal section 863 of drive information updates drive information. The renewal of drive information is performed by writing the content of the record playback conditions newly learned by (step 1005) and the optical disk unit in the field (for example, head sector of a record playback condition list) to which it was assigned to the number 0, after moving at a time the one sector of the contents of the record playback conditions currently recorded on the field to which the number 0 - the number 14 were assigned to low order (step 1006).
[0133] Thus, the drive information stored in the drive information storing buffer 840 is updated (steps 1005 and 1006).
[0134] The renewal section 863 of drive information records the drive information updated in step 1005 and step 1006 on block [1st] drive information field 502a using the record control section 820 (step 1007). For example, the updated drive information (record playback condition list) is recorded on the ECC block of the 1st block. Then, the renewal section 863 of drive information records the same thing as the drive information recorded at step 1007 on block [2nd] drive information field 502b (step 1008). For example, the updated drive information (record playback condition list) is recorded on the ECC block of the 2nd block.
[0135] In addition, when the drive information stored in the drive information storing buffer 840 is the drive information fill uped with NULL value "00" h generated in step 905 shown in drawing 9 , processing always progresses to the No side in the judgment of step 1001. The playback record conditions of NULL value "00" h are because it is available to no optical disk units. Therefore, the renewal section 863 of drive information updates drive information according to step 1003 mentioned above - step 1008. Consequently, the content of the record playback conditions newly learned by the optical disk unit is written in the field (for example, head sector of a record playback condition list) to which each number 0 of 1st drive information field 502a and 2nd drive information field 502b was assigned, and it is written in the field to which each number 1 of 1st drive information field 502a and 2nd drive information field 502b - a number 15 were assigned for NULL value "00" h.
[0136] Thus, the renewal section 863 of drive information updates drive information so that the record playback conditions newly searched for by study processing may always be recorded on the head of a record playback condition list. Consequently, it is guaranteed that drive information always includes the 16 newest record playback conditions.
[0137] In addition, with the gestalt 3 of operation, the record playback condition list was updated by recording the record playback conditions newly searched for on the head of a record playback condition list. Or you may make it update a record playback condition list by recording the record playback

conditions newly searched for on the tail of a record playback condition list. In this case, what is necessary is to move one sector of each record playback conditions of a record playback condition list at a time to a high order, and just to delete the record playback conditions of the head of a record playback condition list.

[0138] Drawing 11 shows the procedure of study processing, and the procedure of an update process of drive information. Study processing is performed by the study processing section 862. An update process of drive information is performed by the renewal section 863 of drive information.

[0139] In drawing 11 , step 1101 to the step 1108 is the same processing as step 1001 to the step 1008 shown in drawing 10 . Therefore, the explanation is omitted.

[0140] When the judgment of step 1102 of the renewal section 863 of drive information is Yes () Namely, in two or more record playback conditions included in the drive information stored in the drive information storing buffer 840 When record playback conditions with an available optical disk unit 800 exist and it is judged with the available record playback condition being suitable as a result of trial record The record playback condition judged that is suitable is once stored in a data buffer 850, and the record playback conditions of being located in a high order from the judged suitable record playback condition are moved to low order by 1 sector (step 1109). Then, the renewal section 863 of drive information is recorded on the field (for example, head sector of a record playback condition list) to which the content of the record playback conditions stored in the data buffer 850 was assigned to the number 0 (step 1110).

[0141] Thus, the drive information stored in the drive information storing buffer 840 is updated (steps 1109 and 1110).

[0142] The renewal section 863 of drive information records the drive information updated in step 1109 and step 1110 on block [1st] drive information field 502a using the record control section 820 (step 1107). For example, the updated drive information (record playback condition list) is recorded on the ECC block of the 1st block. Then, the renewal section 863 of drive information records the same thing as the drive information recorded at step 1107 on block [2nd] drive information field 502b (step 1108). For example, the updated drive information (record playback condition list) is recorded on the ECC block of the 2nd block.

[0143] Thus, the renewal section 863 of drive information always records record playback conditions with the available optical disk unit equipped with an optical disk 101 on the drive information field 502 as record playback conditions most recorded on the drive information field 502 at the latest time of day. Consequently, it is guaranteed that drive information always includes the 16 newest record playback conditions.

[0144] In addition, although the record playback condition list was updated with the gestalt 3 of operation by moving the record playback conditions of being located in a high order from the record playback conditions judged that are suitable to low order by 1 sector, and recording the record playback conditions stored in the data buffer 850 on the head of a record playback condition list It may be made to update a record playback condition list by moving the record playback conditions of being located in low order from the record playback conditions judged that are suitable to a high order by 1 sector, and storing in the tail of a record playback condition list the record playback conditions stored in the data buffer 850.

[0145] In addition, with the gestalt 3 of operation, although the example containing 1st drive information field 502a and 2nd drive information field 502b was explained, as for the drive information field 502, the drive information field 502 may include L drive information fields (1st drive information field 502-1 - Lth drive information field 502-L). Here, L is the integer of two or more arbitration. In this case, what is necessary is to judge whether it is possible to read drive information from the 1st drive information field 502-1 in order toward Lth drive information field 502-L, and just to store in the drive information storing buffer 840 the drive information which succeeded in read-out. What is necessary is just to store in the drive information storing buffer 840 the drive information fill uped with NULL value "00" h, when either of the 1st drive information field 502-1 to the Lth drive information fields is not able to read a drive information field, either. Such processing is the same as the drive information read-out

processing shown in drawing 9 .
[0146]
[Effect of the Invention] According to the information record medium of this invention, two or more record playback conditions are arranged in order of the time of day recorded on the information record medium. Thereby, it is guaranteed that drive information always includes the newest record playback conditions, without having a redundant identifier called a study sequence identifier.
[0147] Moreover, according to the information record medium of this invention, the 2nd drive information field for recording the 1st drive information field and the 2nd drive information for recording the 1st drive information is prepared, and it is updated so that it may have a content with the same 1st drive information and 2nd drive information. Thereby, a blemish is sufficient for the 1st drive information field or the 2nd drive information field just, and possibility that it will fail in playback of record playback conditions that dust, a fingerprint, etc. adhere to the 1st drive information field or the 2nd drive information field owing to is reduced.
[0148] When record playback conditions with the available optical disk unit which equipped with the optical disk into two or more record playback conditions included in drive information do not exist according to the information record playback approach of this invention Drive information is updated by moving two or more one record playback conditions of every included in drive information to low order, and adding the record playback conditions searched for by study processing of record playback conditions to the head of drive information. moreover, when record playback conditions with the available information record regenerative apparatus which equipped with the information record medium into two or more record playback conditions included in drive information exist Drive information is updated by moving every one record playback condition of being located in a high order to low order, and moving the available record playback condition to the head of drive information from the available record playback condition. Consequently, it is guaranteed that drive information always includes the newest record playback conditions.

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] The data storage area for recording data, and the 1st drive information field for recording the 1st drive information, It is the information record medium equipped with the 2nd drive information field for recording the 2nd drive information. Each of said 1st drive information and said 2nd drive information Said two or more record playback conditions are an information record medium arranged in order of the time of day recorded on said information record medium including two or more record playback conditions.
[Claim 2] Each of two or more of said record playback conditions is an information record medium according to claim 1 which specifies the operating condition of said information record regenerative apparatus at the time of the information record regenerative apparatus which can equip with said information record medium carrying out record playback of said data.
[Claim 3] Said 1st drive information and said 2nd drive information are an information record medium according to claim 1 updated so that it may have the same content.
[Claim 4] It is the information record medium according to claim 1 whose N each of said 1st drive information field and said 2nd drive information field consists of ECC blocks of N individual for calculating an error correcting code, each of two or more of said record playback conditions is recorded in one sector which corresponds among said two or more sectors including the sector of plurality [each / of an ECC block of said N individual], and is one or more integers.
[Claim 5] Said single ECC block is an information record medium according to claim 4 with which it is recorded including 16 sectors in one sector to which each of 16 record playback conditions corresponds among said 16 sectors by each of said 1st drive information field and said 2nd drive information field consisting of single ECC blocks.
[Claim 6] The data storage area for recording data, and the 1st drive information field for recording the 1st drive information, It is the information record playback approach for the information record medium equipped with the 2nd drive information field for recording the 2nd drive information. Each of said 1st drive information and said 2nd drive information Two or more record playback conditions are included. Said information record playback approach (a) The step which judges whether it is possible to read said 1st drive information from said 1st drive information field, (b) The step which judges whether there are any record playback conditions with the available information record regenerative apparatus which equipped with said information record medium into two or more record playback conditions included in said 1st drive information, (c) when it can be possible to read said 1st drive information and said available record playback conditions cannot be found into said 1st drive information Learn new record playback conditions with said available information record regenerative apparatus equipped with said information record medium, and said new record playback conditions and said 1st drive information are used. The information record playback approach which includes the step which updates said 1st drive information and said 2nd drive information.
[Claim 7] Each of two or more of said record playback conditions is the information record playback approach according to claim 6 of specifying the operating condition of said information record

regenerative apparatus at the time of the information record regenerative apparatus which can equip with said information record medium carrying out record playback of said data.

[Claim 8] The information record playback approach according to claim 6 which includes further the step which carries out record playback of said data using said 1st drive information when it is possible to read said 1st drive information.

[Claim 9] Said step (c) is the information record playback approach according to claim 6 which includes the step at which said information record regenerative apparatus equipped with said information record medium records available record playback conditions on said 1st drive information as record playback conditions most recorded on said 1st drive information at the latest time of day.

[Claim 10] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said step (c) The step which writes the content of the record playback conditions currently written in the field to which the number 0 of said 1st drive information field - the number 14 were assigned in the field to which it was assigned to each number 1 of said 1st drive information field and said 2nd drive information field - a number 15, (c-1) (c-2) The information record playback approach according to claim 6 which includes the step which writes the content of said new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.

[Claim 11] When said information record playback approach can read the 1st drive information of (d) above and said available record playback conditions are in said 1st drive information The information record playback approach according to claim 6 which includes further the step which updates said 1st drive information and said 2nd drive information using said available record playback conditions and said 1st drive information.

[Claim 12] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said available record playback conditions are written in the field to which the number m of said 1st drive information field was assigned. Said step (d) The step which reads said available record playback conditions from the field where the number m of said 1st drive information field was assigned, (d-1) The step which writes the content of the record playback conditions currently written in the field to which the number 0 of said 1st drive information field - the number (m-1) were assigned in the field to which it was assigned to each number 1 - number m of said 1st drive information field and said 2nd drive information field, (d-2) (d-3) The information record playback approach according to claim 11 which includes the step which writes the content of said available record playback conditions by which reading appearance was carried out in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.

[Claim 13] Said 1st drive information field consists of ECC blocks of N individual for calculating an error correcting code. Each of two or more of said record playback conditions that each of an ECC block of said N individual is contained in said 1st drive information including two or more sectors It is the information record playback approach according to claim 6 that it is recorded in one sector which corresponds among said two or more sectors, and N is one or more integers.

[Claim 14] The judgment with possible reading said 1st drive information is the information record playback approach according to claim 13 performed based on whether all playbacks of an ECC block of said N individual contained to said 1st drive information field are successful.

[Claim 15] The step which judges that said information record playback approach can read said 2nd drive information from the 2nd drive information field of (e) above, (f) The step which judges whether there are any record playback conditions with the available information record regenerative apparatus which equipped with said information record medium into two or more record playback conditions included in said 2nd drive information, It is impossible to read said 1st drive information. (g) -- When it can be possible to read said 2nd drive information and said available record playback conditions cannot be found into said 2nd drive information Learn new record playback conditions with said available information record regenerative apparatus equipped with said information record medium, and said new record playback conditions and said 2nd drive information are used. The information record playback approach according to claim 6 which includes further the step which updates said 1st drive information and said 2nd drive information.

[Claim 16] The information record playback approach according to claim 15 which includes further the step which carries out record playback of said data using said 2nd drive information when it is possible to read said 2nd drive information.

[Claim 17] Said step (g) is the information record playback approach according to claim 15 which includes the step at which said information record regenerative apparatus equipped with said information record medium records available record playback conditions on said 2nd drive information as record playback conditions most recorded on said 2nd drive information at the latest time of day.

[Claim 18] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said step (g) The step which writes the content of the record playback conditions currently written in the field to which the number 0 of said 2nd drive information field - the number 14 were assigned in the field to which it was assigned to each number 1 of said 1st drive information field and said 2nd drive information field - a number 15, (g-1) (g-2) The information record playback approach according to claim 15 which includes the step which writes the content of said new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.

[Claim 19] Said information record playback approach cannot read the 1st drive information of (h) above. and when it is possible to read said 2nd drive information and said available record playback conditions are in said 2nd drive information The information record playback approach according to claim 15 which includes further the step which updates said 1st drive information and said 2nd drive information using said available record playback conditions and said 2nd drive information.

[Claim 20] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said available record playback conditions are written in the field to which the number m of said 2nd drive information field was assigned. Said step (h) The step which reads said available record playback conditions from the field where the number m of said 2nd drive information field was assigned, (h-1) The step which writes the content of the record playback conditions currently written in the field to which the number 0 of said 2nd drive information field - the number (m-1) were assigned in the field to which it was assigned to each number 1 - number m of said 1st drive information field and said 2nd drive information field, (h-2) (h-3) The information record playback approach according to claim 19 which includes the step which writes the content of said available record playback conditions by which reading appearance was carried out in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.

[Claim 21] Said 2nd drive information field consists of ECC blocks of N individual for calculating an error correcting code. Each of two or more of said record playback conditions that each of an ECC block of said N individual is contained in said 2nd drive information including two or more sectors It is the

information record playback approach according to claim 15 that it is recorded in one sector which corresponds among said two or more sectors, and N is one or more integers.
[Claim 22] The judgment with possible reading said 2nd drive information is the information record playback approach according to claim 21 performed based on whether all playbacks of an ECC block of said N individual contained to said 2nd drive information field are successful.
[Claim 23] When said information record playback approach cannot read the 1st drive information of (i) above and it is impossible to read said 2nd drive information The information record playback approach according to claim 15 that said information record regenerative apparatus equipped with said information record medium learns available new record playback conditions, and includes further the step which updates said 1st drive information and said 2nd drive information using said new record playback conditions.
[Claim 24] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. The step at which said step (i) writes the content of said (i-1) new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field, (i-2) The information record playback approach according to claim 23 which includes the step which buries the content of the record playback conditions currently written in the field to which each number 1 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned by "00" h.
[Claim 25] The data storage area for recording data, and the 1st drive information field for recording the 1st drive information, It is an information record regenerative apparatus for the information record medium equipped with the 2nd drive information field for recording the 2nd drive information. Each of said 1st drive information and said 2nd drive information Two or more record playback conditions are included. Said information record regenerative apparatus It has the drive information read-out section, the study processing section, and the renewal section of drive information. Said drive information read-out section It judges whether it is possible to read said 1st drive information from said 1st drive information field. Said study processing section It judges whether record playback conditions with said available information record regenerative apparatus are in two or more record playback conditions included in said 1st drive information. When it can be possible to read said 1st drive information and said available record playback conditions cannot be found into said 1st drive information It is the information record regenerative apparatus with which said study processing section learns new record playback conditions with said available information record regenerative apparatus, and said renewal section of drive information updates said 1st drive information and said 2nd drive information using said new record playback conditions and said 1st drive information.
[Claim 26] Each of two or more of said record playback conditions is an information record regenerative apparatus according to claim 25 which specifies the operating condition of said information record regenerative apparatus at the time of the information record regenerative apparatus which can equip with said information record medium carrying out record playback of said data.
[Claim 27] The information record regenerative apparatus according to claim 25 further equipped with the control section which carries out record playback of said data using said 1st drive information when it is possible to read said 1st drive information.
[Claim 28] Said renewal section of drive information is an information record regenerative apparatus according to claim 25 with which said information record regenerative apparatus records available record playback conditions on said 1st drive information as record playback conditions most recorded on said 1st drive information at the latest time of day.
[Claim 29] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is

written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said renewal section of drive information is written in the field to which the content of the record playback conditions currently written in the field to which the number 0 of said 1st drive information field - the number 14 were assigned was assigned to each number 1 of said 1st drive information field and said 2nd drive information field - a number 15. The information record regenerative apparatus according to claim 25 which writes the content of said new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.
[Claim 30] Said renewal section of drive information is an information record regenerative apparatus according to claim 25 which updates said 1st drive information and said 2nd drive information using said available record playback conditions and said 1st drive information when it is possible to read said 1st drive information and said available record playback conditions are in said 1st drive information.
<BR> [Claim 31] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said available record playback conditions are written in the field to which the number m of said 1st drive information field was assigned. Said renewal section of drive information Said available record playback conditions are read from the field where the number m of said 1st drive information field was assigned. The content of the record playback conditions currently written in the field to which the number 0 of said 1st drive information field - the number (m-1) were assigned is written in the field to which it was assigned to each number 1 - number m of said 1st drive information field and said 2nd drive information field. The information record regenerative apparatus according to claim 30 which writes the content of said available record playback conditions by which reading appearance was carried out in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.
[Claim 32] Said 1st drive information field consists of ECC blocks of N individual for calculating an error correcting code. Each of two or more of said record playback conditions that each of an ECC block of said N individual is contained in said 1st drive information including two or more sectors It is the information record regenerative apparatus according to claim 25 whose N it is recorded in one sector which corresponds among said two or more sectors, and is one or more integers.
[Claim 33] The judgment with possible reading said 1st drive information is an information record regenerative apparatus according to claim 32 performed based on whether all playbacks of an ECC block of said N individual contained to said 1st drive information field are successful.
[Claim 34] It judges that said drive information read-out section can read said 2nd drive information from said 2nd drive information field. Said study processing section It judges whether record playback conditions with said available information record regenerative apparatus are in two or more record playback conditions included in said 2nd drive information. It is impossible to read said 1st drive information, and it is possible to read said 2nd drive information. and when said available record playback conditions cannot be found into said 2nd drive information Said study processing section learns new record playback conditions with said available information record regenerative apparatus. Said renewal section of drive information The information record regenerative apparatus according to claim 25 which updates said 1st drive information and said 2nd drive information using said new record playback conditions and said 2nd drive information.
[Claim 35] The information record regenerative apparatus according to claim 34 further equipped with the control section which carries out record playback of said data using said 2nd drive information when it is possible to read said 2nd drive information.
[Claim 36] Said renewal section of drive information is an information record regenerative apparatus according to claim 34 with which said information record regenerative apparatus records available

record playback conditions on said 2nd drive information as record playback conditions most recorded on said 2nd drive information at the latest time of day.
[Claim 37] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said renewal section of drive information is written in the field to which the content of the record playback conditions currently written in the field to which the number 0 of said 2nd drive information field - the number 14 were assigned was assigned to each number 1 of said 1st drive information field and said 2nd drive information field - a number 15. The information record regenerative apparatus according to claim 34 which writes the content of said new record playback conditions in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.
[Claim 38] Said renewal section of drive information cannot read said 1st drive information. and when it is possible to read said 2nd drive information and said available record playback conditions are in said 2nd drive information The information record regenerative apparatus according to claim 34 which updates said 1st drive information and said 2nd drive information using said available record playback conditions and said 2nd drive information.
[Claim 39] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said available record playback conditions are written in the field to which the number m of said 2nd drive information field was assigned. Said renewal section of drive information Said available record playback conditions are read from the field where the number m of said 2nd drive information field was assigned. The content of the record playback conditions currently written in the field to which the number 0 of said 2nd drive information field - the number (m-1) were assigned is written in the field to which it was assigned to each number 1 - number m of said 1st drive information field and said 2nd drive information field. The information record regenerative apparatus according to claim 38 which writes the content of said available record playback conditions by which reading appearance was carried out in the field to which it was assigned to each number 0 of said 1st drive information field and the 2nd drive information field.
[Claim 40] Said 2nd drive information field consists of ECC blocks of N individual for calculating an error correcting code. Each of two or more of said record playback conditions that each of an ECC block of said N individual is contained in said 2nd drive information including two or more sectors It is the information record regenerative apparatus according to claim 34 whose N it is recorded in one sector which corresponds among said two or more sectors, and is one or more integers.
[Claim 41] The judgment with possible reading said 2nd drive information is an information record regenerative apparatus according to claim 40 performed based on whether all playbacks of an ECC block of said N individual contained to said 2nd drive information field are successful.
[Claim 42] When it is impossible to read said 1st drive information and it is impossible to read said 2nd drive information It is the information record regenerative apparatus according to claim 34 with which said study processing section learns new record playback conditions with said available information record regenerative apparatus, and said renewal section of drive information updates said 1st drive information and said 2nd drive information using said new record playback conditions.
[Claim 43] Each of said 1st drive information field and said 2nd drive information field It has the field where the number 0 - the number 15 were assigned. Each of said 1st drive information and said 2nd drive information 16 record playback conditions are included. Said 16 record playback conditions It is written in the field to which each number 0 of said 1st drive information field and said 2nd drive

information field - a number 15 were assigned to the sequence from what to the old thing has the new time of day recorded on said information record medium. Said renewal section of drive information is written in the field to which the content of said new record playback conditions was assigned to each number 0 of said 1st drive information field and the 2nd drive information field. The information record regenerative apparatus according to claim 42 which buries the content of the record playback conditions currently written in the field to which each number 1 of said 1st drive information field and said 2nd drive information field - a number 15 were assigned by "00" h.

[Translation done.]

* NOTICES *

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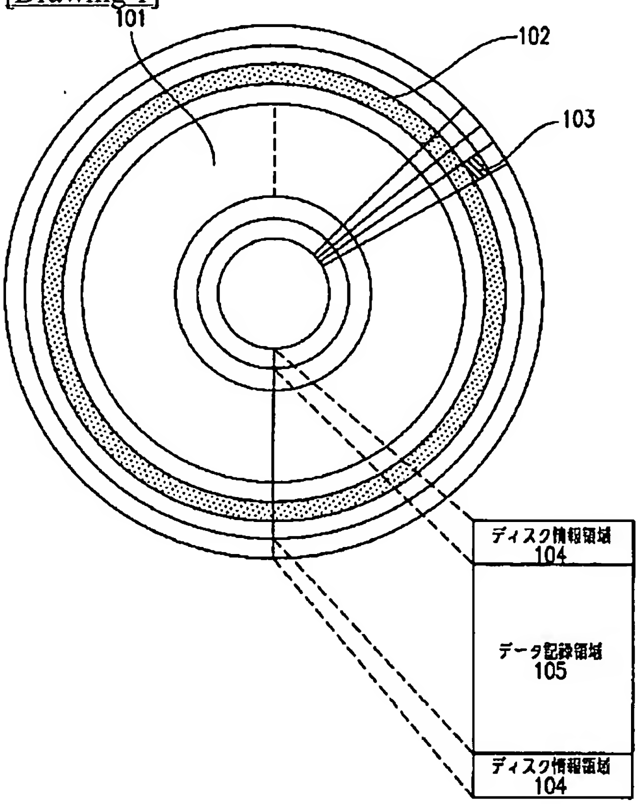
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]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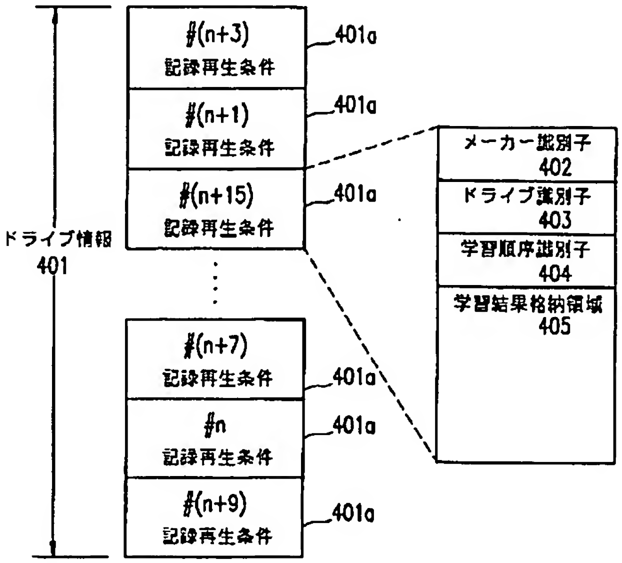
102
103
ディスク情報領域
104
データ記録領域
105
ディスク情報領域
104

[Drawing 4]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401a
ドライブ情報
401
メーカー識別子
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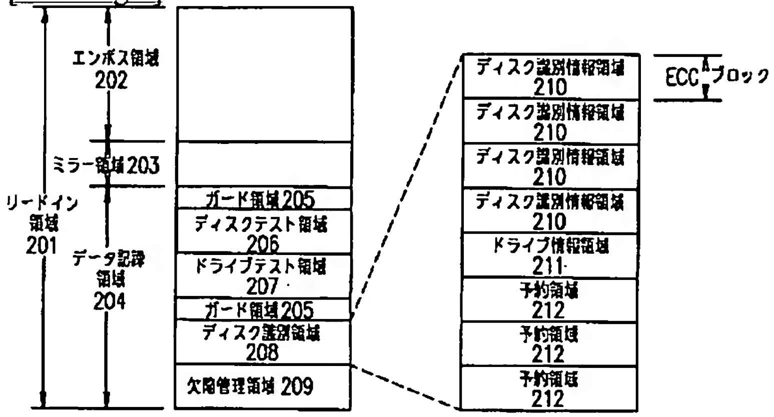
[Drawing 2]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リードイン
領域
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データ記録
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ガード領域205
ディスクテスト領域
206
ドライブテスト領域
207
ガード領域205
ディスク識別領域
208
欠陥管理領域 209
ディスク識別情報領域
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210
ディスク識別情報領域
210
ディスク識別情報領域
210
ドライブ情報領域
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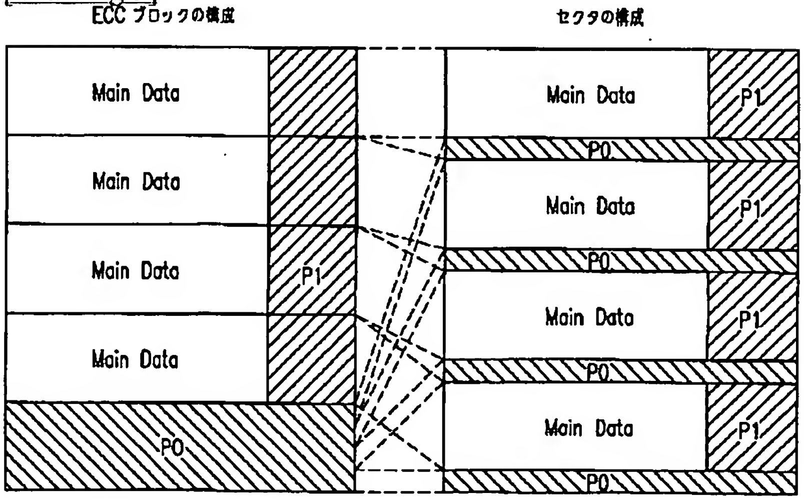
212
ECC ブロック

[Drawing 3]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セクタの構成
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PO
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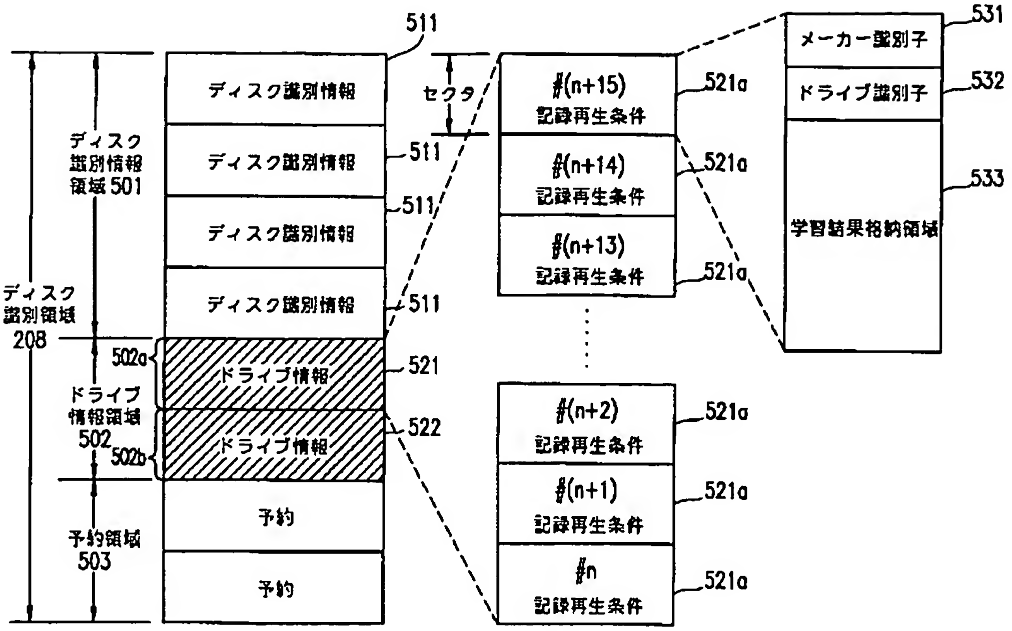
P1
PO

[Drawing 5]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ディスク識別情報領域 501
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502a
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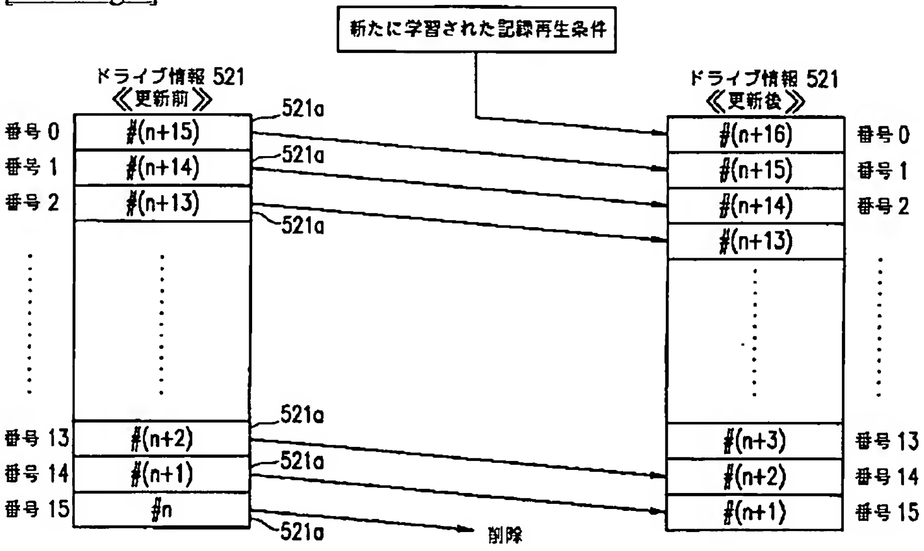
[Drawing 6]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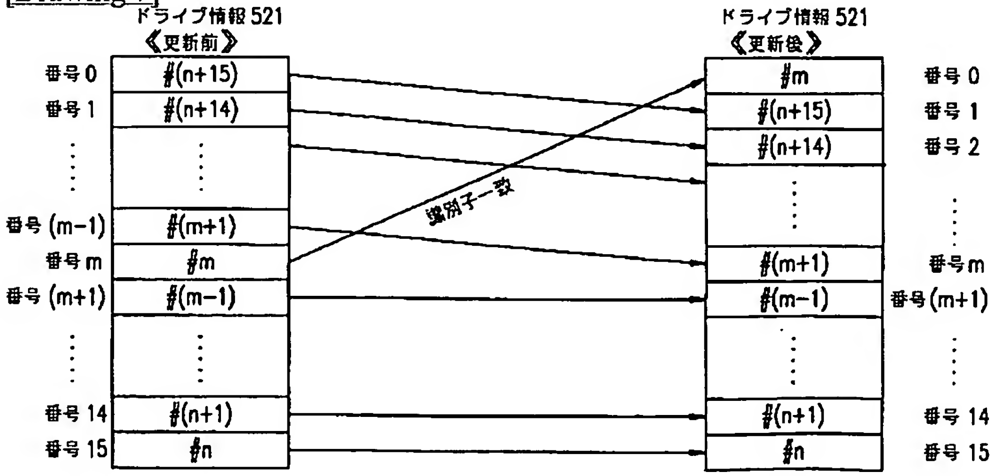
[Drawing 7]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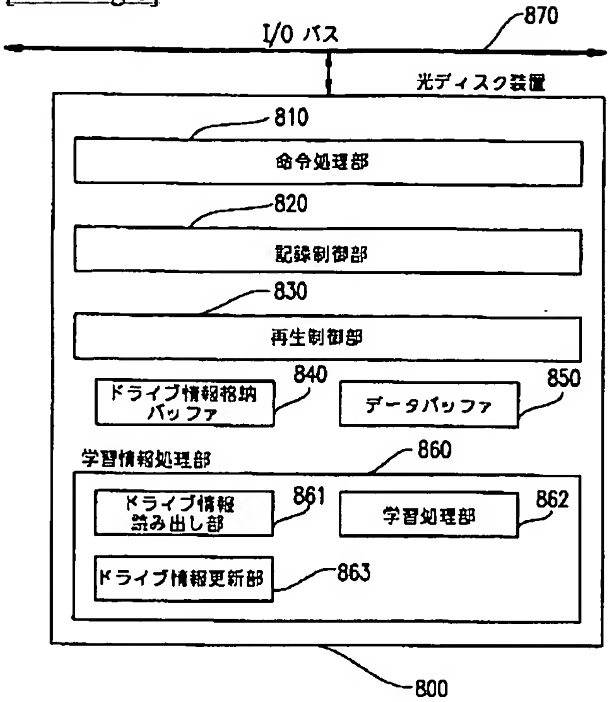
[Drawing 8]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バッファ
850
データバッファ
学習情報処理部
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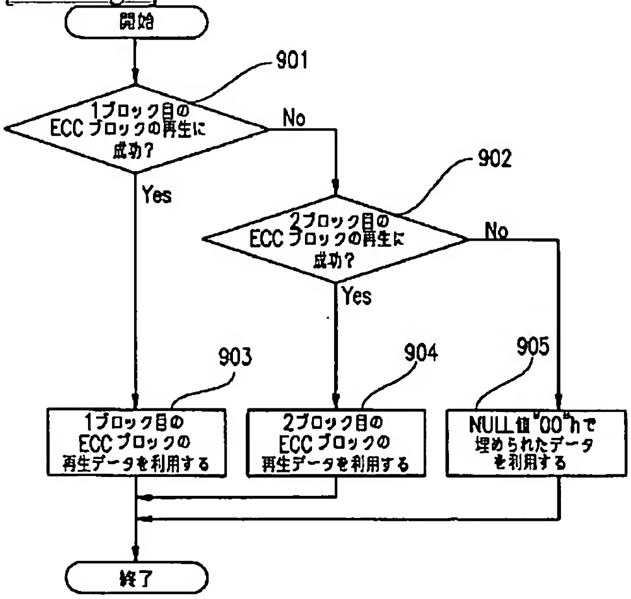
863
800

[Drawing 9]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904
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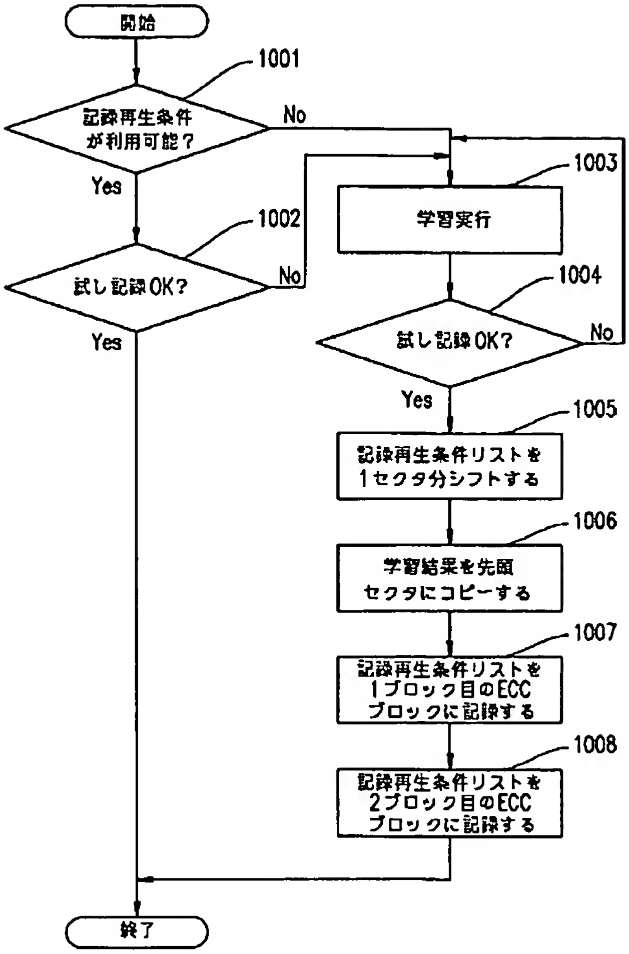
[Drawing 10]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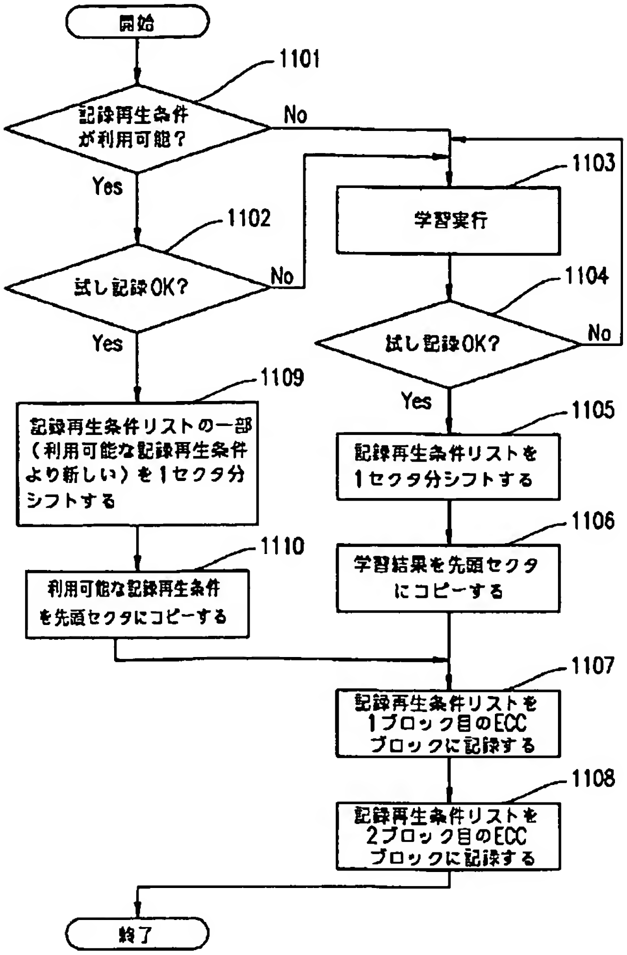
[Drawing 11]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1106
学習結果を先頭セクタにコピーする
1110
利用可能な記録再生条件を先頭セクタにコピーする
1107
記録再生条件リストを1ブロック目のECCブロックに記録する
1108
記録再生条件リストを2ブロック目のECCブロックに記録する
終了

[Translation done.]